



MATHEMATICS TEST

60 Minutes—60 Questions

DIRECTIONS: Solve each problem, choose the correct answer, and then fill in the corresponding oval on your answer document.

Do not linger over problems that take too much time. Solve as many as you can; then return to the others in the time you have left for this test.

You are permitted to use a calculator on this test. You may use your calculator for any problems you choose,

but some of the problems may best be done without using a calculator.

Note: Unless otherwise stated, all of the following should be assumed.

1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

1. $(3x + 2)(5x - 1)$ is equivalent to:

- A. $20x^2$
- B. $8x + 1$
- C. $15x^2 - 2$
- D. $8x^2 + 4x + 1$
- E. $15x^2 + 7x - 2$

DO YOUR FIGURING HERE.

2. What is the perimeter, in centimeters, of a rectangle if its length is 7 cm and its width is 3 cm?

- F. 10
- G. 14
- H. 20
- J. 21
- K. 42

3. Vivian made 63 free throws out of 89 attempts during the basketball season. What percentage, to the nearest percent, of her free throws did she make during this season?

- A. 41%
- B. 63%
- C. 71%
- D. 89%
- E. 98%

4. What (x,y) pair is the solution to the system of equations below?

$$\begin{aligned}x + y &= 0 \\x - y &= 0\end{aligned}$$

- F. $(5, 5)$
- G. $(4, -4)$
- H. $(0, 0)$
- J. $(-3, 3)$
- K. $(-2, -2)$

2**2**

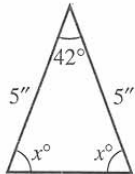
5. The commutative property of addition states that $a + b = b + a$; thus the order of the numbers does not matter. This property can be translated to apply to 2 events; thus the events are commutative if their order does not change the result.

DO YOUR FIGURING HERE.

For example: When you start a written assignment, opening your textbook and then taking a sheet of paper out of your folder produces the same result as taking a sheet of paper out of your folder and then opening your textbook.

Which of the following pairs of events illustrates this commutative property?

- A. You put your shoes on your feet; you put your socks on your feet.
 B. You tie your left shoe; you tie your right shoe.
 C. You put on your shirt; you put on your jacket.
 D. You read a book; you write a report about the book's story.
 E. You watch a videotape; you rewind the videotape.
6. In the triangle shown below, what number does x represent?

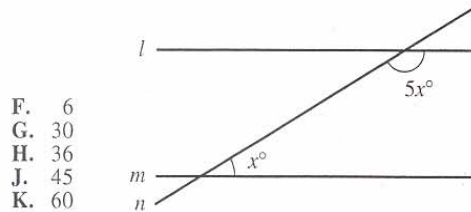


- F. 42
 G. 64
 H. 69
 J. 74
 K. Cannot be determined from the given information
7. Lydia and Roberta are painting a room in the city recreation center. On the first day, Lydia used $\frac{1}{2}$ gallon of paint and Roberta used $1\frac{1}{4}$ gallons of paint. If 5 gallons of paint was purchased, how many gallons of paint were left after the first day?
- A. $1\frac{3}{4}$
 B. $3\frac{1}{4}$
 C. $3\frac{2}{3}$
 D. $3\frac{5}{6}$
 E. $4\frac{1}{4}$



8. In the figure below, parallel lines l and m are intersected by line n . What is the value of x ?

DO YOUR FIGURING HERE.



- F. 6
G. 30
H. 36
J. 45
K. 60

9. The equation of a circle is $x^2 + y^2 = 36$. If this circle is graphed in the standard (x,y) coordinate plane, what will be the y -intercepts?

- A. $(0, 1)$ and $(0, -1)$
B. $(0, 6)$ and $(0, -6)$
C. $(0, 12)$ and $(0, -12)$
D. $(0, 18)$ and $(0, -18)$
E. $(0, 36)$ and $(0, -36)$

10. The length and width of a rectangular practice field for the new spaceball game must be $3x$ yards and $(2x - 5)$ yards, respectively. Which of the following expressions in terms of x gives the number of square yards of artificial grass needed to cover the field?

- F. $5x - 5$
G. $10x - 10$
H. $15x - 6x^2$
J. $6x^2 - 15x$
K. $24x^2 - 60x$

11. In the geometric sequence

$$8, 2, \frac{1}{2}, N, \dots$$

what is the 4th term, N ?

- A. $\frac{1}{4}$
B. $\frac{1}{8}$
C. $\frac{1}{16}$
D. $\frac{1}{32}$
E. $\frac{1}{64}$



DO YOUR FIGURING HERE.

12. A preelection survey indicated that the incumbent would receive 50% of the vote while the challenger would receive 40% of the vote. Write-in candidates would receive the remaining 10% of the vote. The survey predictions proved to be accurate, and the incumbent won, receiving about 1,000 votes. About how many votes did the challenger receive?

F. 40
 G. 200
 H. 400
 J. 500
 K. 800

13. What is the value of $|-3| - |7 - 16|$?

A. -12
 B. -6
 C. 6
 D. 12
 E. 26

14. Every day at 8:00 A.M. during a school week in January, Jim and Maya measured the outdoor temperature and recorded it in the table shown below. For that school week, what was the average 8:00 A.M. temperature, in degrees Celsius?

| Day | Temperature (° Celsius) |
|-----|----------------------------|
| M | 3° |
| Tu | -5° |
| W | -3° |
| Th | 5° |
| F | 5° |

F. 0°
 G. 1°
 H. 3°
 J. 4°
 K. 5°

15. Miguel is going on a business trip to Toronto, Canada. He is exchanging some U.S. dollars for Canadian dollars. If the exchange rate between the number of U.S. dollars (u) and the number of Canadian dollars (c) is expressed in the equation $1.3u = c$, approximately how many Canadian dollars will Miguel receive in exchange for 845 U.S. dollars?

A. 650
 B. 850
 C. 920
 D. 1,100
 E. 1,540

16. At what speed, in miles per hour, would you be walking if you walked 1.3 miles in 20 minutes?

F. 1.3
 G. 2.6
 H. 3.2
 J. 3.9
 K. 5.2



DO YOUR FIGURING HERE.

17. Rebecca, who is 2 years old, has a toy computer designed to teach children the alphabet. The keyboard has 26 keys, 1 for each of the 26 capital letters of the alphabet. When she presses a key at random, what is the probability that it will be a letter found in REBECCA ?

- A. $\frac{1}{5}$
- B. $\frac{7}{19}$
- C. $\frac{5}{21}$
- D. $\frac{5}{26}$
- E. $\frac{7}{26}$

18. If $n = 3$, what is the value of $7n - 3n^n$?

- F. -222
- G. -195
- H. -60
- J. -8
- K. -6

19. Which of the following is a factor of $a^2 + 7a - 18$?

- A. $a - 9$
- B. $a - 3$
- C. $a - 2$
- D. $a + 3$
- E. $a + 6$

20. If the point with coordinates $(3, y_1)$ lies on the graph of $y = -3x + 2$, what is the value of y_1 ?

- F. -7
- G. -11
- H. -18
- J. -31
- K. -35

21. If $5y = 4x - 9$, then $x =$?

- A. $y + 9$
- B. $\frac{5}{4}y - 9$
- C. $\frac{5}{4}y + 9$
- D. $\frac{5y - 9}{4}$
- E. $\frac{5y + 9}{4}$



DO YOUR FIGURING HERE.

22. A box of candy is filled by weight in the factory. If each piece of candy weighs about 0.07 ounces, about how many pieces of candy are needed to fill a box with 10.5 ounces of candy?

F. 10
G. 15
H. 18
J. 74
K. 150

23. If $6 - 2(x - 3) = 8$, then $x = ?$

A. 2
B. $\frac{1}{2}$
C. $-\frac{5}{2}$
D. -4
E. -10

24. The diameter of a circle is 10 units long. What is the area of the circle, in square units?

F. 5π
G. 10π
H. 25π
J. 100π
K. 400π

25. For all x , $2(-3x)^2$ is equivalent to:

A. $-36x^2$
B. $-18x^2$
C. $-6x^2$
D. $18x^2$
E. $36x^2$

26. In the complex number system, $i^2 = -1$. What does $(2 + 3i)(-1 + 7i)$ equal?

F. $-23 + 0i$
G. $-23 + 11i$
H. $0 + 11i$
J. $0 + 30i$
K. $19 + 11i$

27. If n is an integer and $n \neq 1$, then $(1 - n)^4$ must be:

A. a positive integer.
B. a negative integer.
C. an even integer.
D. an odd integer.
E. an integer divisible by 4.

2**2**

28. Which of the following is equivalent to $(x^2 - 4x) + (x^2 - 3) - (2x - 4)$?

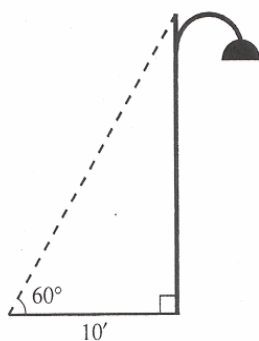
DO YOUR FIGURING HERE.

- F. $2x^2 - 6x - 7$
 G. $2x^2 - 6x + 1$
 H. $2x^4 - 6x^2 - 7$
 J. $2x^4 - 6x^2 + 1$
 K. $-2x^4 + 6x - 7$

29. Simple interest can be calculated using the formula $I = Prt$, where I is the interest, P is the principal (that is, the amount borrowed), r is the yearly interest rate, and t is the number of years the money is borrowed. If you borrowed P dollars for t years, and paid I dollars in interest, how could you calculate the yearly interest rate, r , you were charged?

- A. Divide the product IP by t
 B. Divide the product Pt by I
 C. Divide I by the product Pt
 D. Divide I by the sum $P + t$
 E. Multiply P , I , and t

30. A lamppost, shown below, casts a 10-foot shadow when the sun is at a 60° angle with the ground. Which of the following equations gives the height x , in feet, of the lamppost?



- F. $\cos 60^\circ = \frac{x}{10}$
 G. $\cot 60^\circ = \frac{x}{10}$
 H. $\sec 60^\circ = \frac{x}{10}$
 J. $\sin 60^\circ = \frac{x}{10}$
 K. $\tan 60^\circ = \frac{x}{10}$

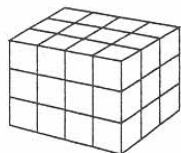


DO YOUR FIGURING HERE.

31. Jana's average test score after 5 tests in chemistry was exactly 86 points, and she scored 78, 93, 84, and 88 points on the first 4 tests. How many points did she score on the 5th test?
- A. 69
 B. 85
 C. 86
 D. 87
 E. 90

32. In the standard (x,y) coordinate plane, what is the slope of the line $4x + 2y = 6$?
- F. -4
 G. -2
 H. 2
 J. 4
 K. 6

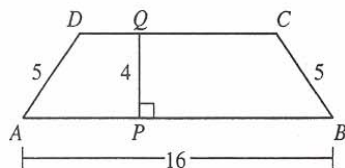
33. Thirty-six identical wooden cubes are attached to form the rectangular solid shown in the diagram below.



How many cubes are completely hidden (that is, the cubes are NOT visible from any point outside the solid)?

- A. 0
 B. 1
 C. 2
 D. 6
 E. 9

34. In isosceles trapezoid $ABCD$ shown below, \overline{QP} is an altitude, and all lengths are given in centimeters. What is the perimeter of trapezoid $ABCD$, in centimeters?



- F. 30
 G. 34
 H. 36
 J. 42
 K. 52

35. For what positive values of x is it true that $x^2 < 2x < x + 2$?
- A. No positive values
 B. Only positive values less than 2
 C. Only positive values between 2 and 4
 D. Only positive values greater than 4
 E. All positive values

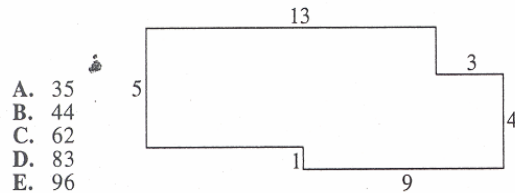
2**2**

36. What is the smallest positive whole number that is divisible with zero remainder by both 15 and 12?

F. 3
 G. 20
 H. 30
 J. 60
 K. 180

DO YOUR FIGURING HERE.

37. If all the angles in the figure shown below are right angles and each dimension given is in inches, then what is the area of the figure, in square inches?



38. What is the distance, in units, between the points (2,3) and (4,5) in the standard (x,y) coordinate plane?

F. 1
 G. $\sqrt{2}$
 H. 2
 J. $2\sqrt{2}$
 K. $4\sqrt{2}$

39. What is the slope of the line through (2,-5) and (-3,4) in the standard (x,y) coordinate plane?

A. $-\frac{9}{5}$
 B. $-\frac{5}{9}$
 C. $\frac{1}{9}$
 D. $\frac{9}{5}$
 E. 9

2**2**

40. At Chang Hardware, electrical cable sells for p cents per foot. Which of the following expressions gives the cost, in cents, of x feet and y inches of cable?

F. $p\left(x + \frac{y}{12}\right)$

G. $p\left(\frac{x}{12} + y\right)$

H. $p(x + 12y)$

J. $p(12x + y)$

K. $12p(x + y)$

DO YOUR FIGURING HERE.

41. For all positive values of s , t , and h , which of the following is equivalent to $\frac{(s^2)^3 t^2 (t)^3}{h^{-2}}$?

A. $s^5 t^6 h^2$

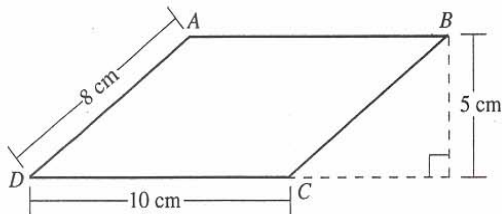
B. $s^6 t^5 h^2$

C. $s^6 t^6 h^2$

D. $\frac{s^5 t^6}{h^2}$

E. $\frac{s^6 t^5}{h^2}$

42. The dimensions of parallelogram $ABCD$, shown below, are given in centimeters. What is the area, in square centimeters, of parallelogram $ABCD$?



- F. 25
 G. 36
 H. 40
 J. 50
 K. 80



DO YOUR FIGURING HERE.

43. The July 1 reading of Mr. Corelli's electric meter, in kilowatt-hours (kwh), was 6,278 kwh. On August 1, his electric meter registered 6,328 kwh but was not read by the utility company. Instead, the company estimated that Mr. Corelli had used 60 kwh of electricity during July. If each kwh costs \$0.10, what, if any, was the *overcharge* on Mr. Corelli's bill for July, which would be credited to his next bill?
- A. \$1
 B. \$3
 C. \$6
 D. \$7
 E. There was no overcharge on the bill.
44. If 2 interior angles of a triangle measure 20° and 60° , respectively, which of the following describes the location of the longest side of the triangle?
- F. Always between the 20° and the 60° angle
 G. Always opposite the 20° angle
 H. Always opposite the 60° angle
 J. Opposite either the 20° or the 60° angle
 K. Cannot be determined from the given information
45. On the number line below, what is the coordinate of the point between *A* and *B* that is twice as far from point *A* as from point *B*?
- A. 14
 B. 10
 C. 8
 D. 6
 E. 2
- A*

+

-6

A

B

+

18
46. From a point exactly 5 feet from the base of a wall, a ladder will reach exactly 12 feet up the wall. Assuming the wall, floor, and ladder are all straight and that the wall is perpendicular to the floor, how many feet long is the ladder?
- F. 13
 G. 17
 H. 43
 J. $\sqrt{17}$
 K. $\sqrt{119}$
47. What is the difference when 1% of 90 is subtracted from the product of 0.1 and 90?
- A. 8.991
 B. 8.91
 C. 8.1
 D. 0.09
 E. 0

2**2****DO YOUR FIGURING HERE.**

48. In the triangle below, the given lengths are expressed in inches. Which of the following is equal to $\sin \beta$?

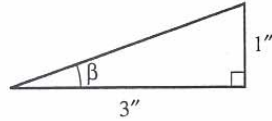
F. $\frac{1}{\sqrt{10}}$

G. $\frac{3}{\sqrt{10}}$

H. $\frac{1}{3}$

J. $\frac{1}{4}$

K. $\frac{\sqrt{10}}{3}$



49. Jamal will use a circle graph to show how he spends his time during a 24-hour day. The size of the sector representing each activity is proportional to the time spent in that activity. Among other activities, Jamal sleeps 9 hours. How many degrees should the central angle measure in the sector representing sleep?

A. 135°

B. $67\frac{1}{2}^\circ$

C. $37\frac{1}{2}^\circ$

D. 15°

E. 9°

50. If $a \neq 0$, b is a real number, $a^3 = b$, and $a^4 = 2b$, then $a = ?$

F. 2

G. 3

H. 4

J. b

K. Cannot be determined from the given information

51. The volume of a sphere is given by the formula $V = \frac{4}{3}\pi r^3$ and its surface area by the formula $S = 4\pi r^2$, where r is the radius of the sphere. What is the volume of a sphere, in cubic centimeters, if its surface area is 144π square centimeters?

A. 24π

B. 32π

C. 72π

D. 256π

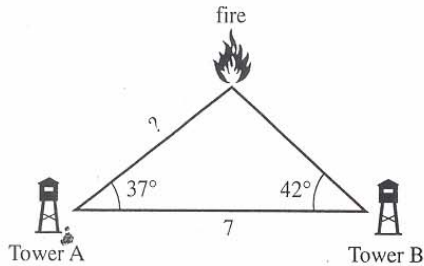
E. 288π

2**2**

52. Two lookout towers are located about 7 miles apart, at the same elevation. A fire is sighted at angles of 37° and 42° from the line of sight between the towers, as indicated in the diagram below. Which of the following expressions, if any, gives the approximate distance, in miles, between the fire and Tower A?

DO YOUR FIGURING HERE.

(Note: The *law of sines* states that the ratio between the length of the side opposite an angle and the sine of that angle is the same for all interior angles in the same triangle.)



- F. The distance cannot be approximated without more information.
- G. $\sqrt{37^2 + 42^2}$
- H. $\frac{7 \cos 42^\circ}{\cos 101^\circ}$
- J. $7 \tan 42^\circ$
- K. $\frac{7 \sin 42^\circ}{\sin 101^\circ}$
53. For all nonzero x and y , $\frac{1}{x} + \frac{1}{y} = ?$
- A. 2
- B. $\frac{1}{xy}$
- C. $\frac{2}{xy}$
- D. $\frac{x+y}{xy}$
- E. $\frac{2}{x+y}$



54. In the standard (x,y) coordinate plane, line l_1 has an equation of $x + 4y = 5$. If line l_2 is perpendicular to l_1 , what is the slope of l_2 ?

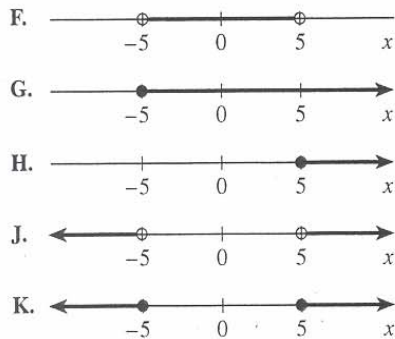
DO YOUR FIGURING HERE.

- F. $-\frac{1}{4}$
 G. $\frac{4}{5}$
 H. 1
 J. $\frac{5}{4}$
 K. 4

55. A parabola with an equation of the form $y = ax^2 + bx + c$ has the point $(3,1)$ as its vertex. If $(1,3)$ also lies on this parabola, which of the following is another point on the parabola?

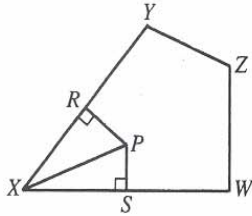
- A. $(-3,-1)$
 B. $(-1,-3)$
 C. $(2, 2)$
 D. $(2, 6)$
 E. $(5, 3)$

56. Which of the following is a graph of the solution set for the inequality $|x| \geq 5$?



2**2**

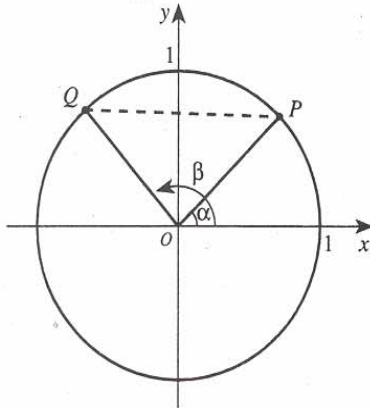
57. In the figure below, the perpendicular bisectors of \overline{XY} and \overline{XW} meet at P .

DO YOUR FIGURING HERE.

Given the information above, a circle with center P and radius \overline{PX} must pass through which of the labeled points?

- A. X only
- B. W and X only
- C. Y and X only
- D. W , X , and Y only
- E. W , X , Y , and Z

58. The figure below shows 2 points, P and Q , on a unit circle. What is the distance, in coordinate units, from P to Q ?



- F. $\sqrt{(\cos \alpha - \cos \beta)^2 + (\sin \alpha - \sin \beta)^2}$
- G. $\sqrt{2 + 2 \cos \alpha \cos \beta + 2 \sin \alpha \sin \beta}$
- H. $2\sqrt{\cos \alpha \cos \beta + \sin \alpha \sin \beta}$
- J. $2\sqrt{\cos \alpha \cos \beta - \sin \alpha \sin \beta}$
- K. $2 \cos \alpha \sin \beta$



59. If $x < 0$ and $y < 0$, which of the following *must* be true for the value of $x - y$?

- A. $x - y < 0$
- B. $x - y < x$
- C. $x - y < y$
- D. $x - y > 0$
- E. $x - y > x$

DO YOUR FIGURING HERE.

60. The length of one side of a square is increased by 25%. By what percent would the length of an adjacent side have to be *decreased* so that the area of the new figure (which will be rectangular) is the same as the area of the original square?

- F. 20%
- G. 25%
- H. 50%
- J. 75%
- K. 80%

END OF TEST 2

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.

DO NOT RETURN TO THE PREVIOUS TEST.